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GB 752293
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(54) Fibrous glass blowing insulation

(57) Fibrous glass blowing insulation is made by slitting and crosscutting a blanket 38 of fibrous glass wool into small columns and conveying the columns to a bagging machine, the columns normally breaking up at random during conveying and packaging into approximate cubes and smaller flakes or prisms of various thicknesses. The flakes may be 89 to 127 mm between opposite sides. The product, and method and apparatus for its manufacture are described and claimed.

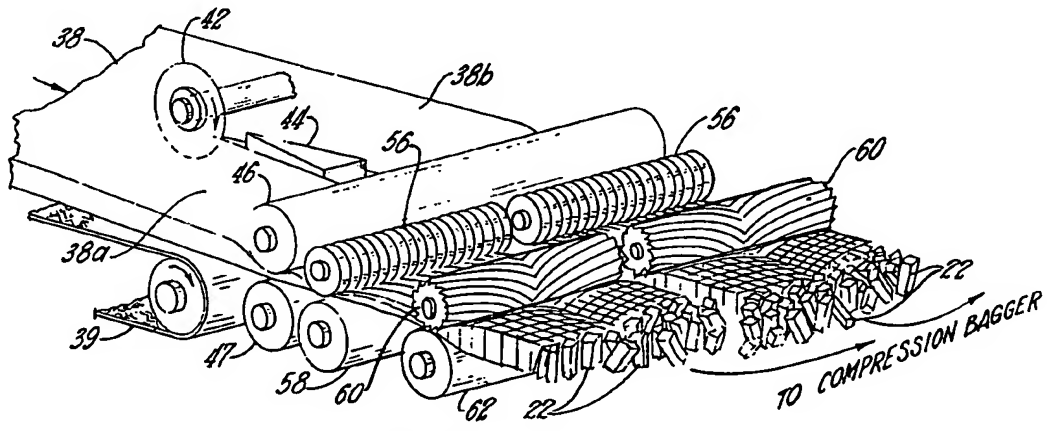

FIG. 8

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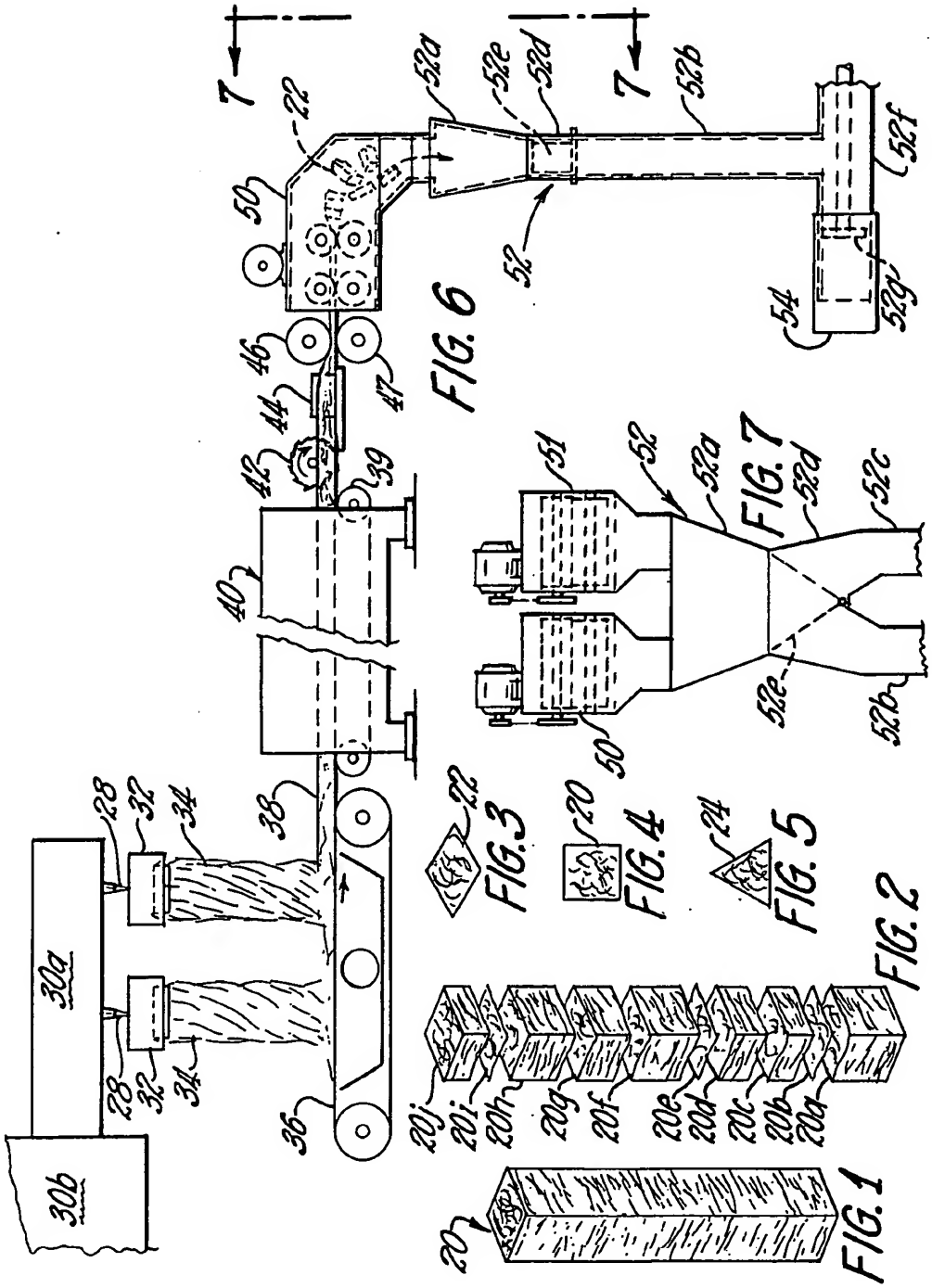

FIG. 6

FIG. 7

FIG. 3

FIG. 4

FIG. 5

FIG. 2

FIG. 1

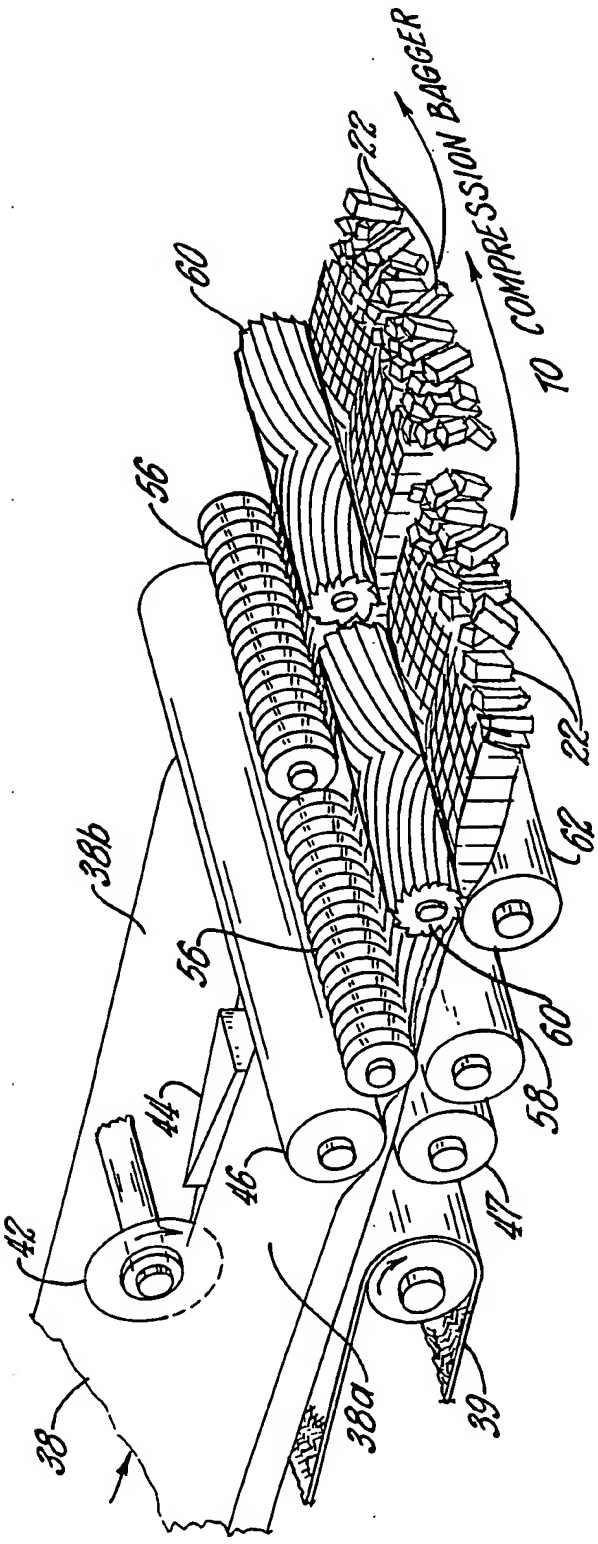
10 COMPRESSION BAGGER
22
60
56
22
62
38b
56
60
58
44
46
47
42
38
38a
39

FIG. 8

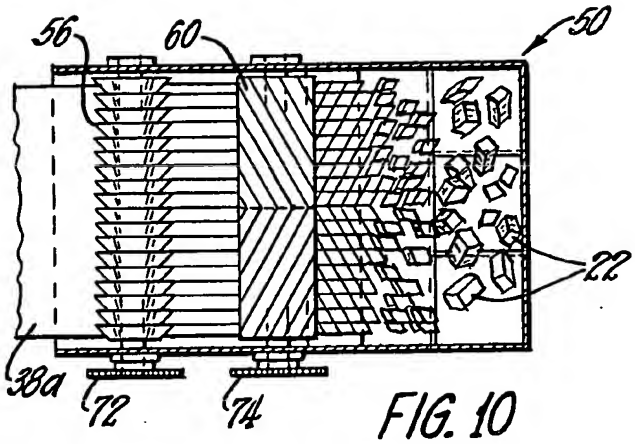

FIG. 10

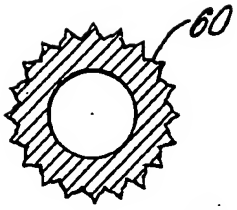

FIG. 12

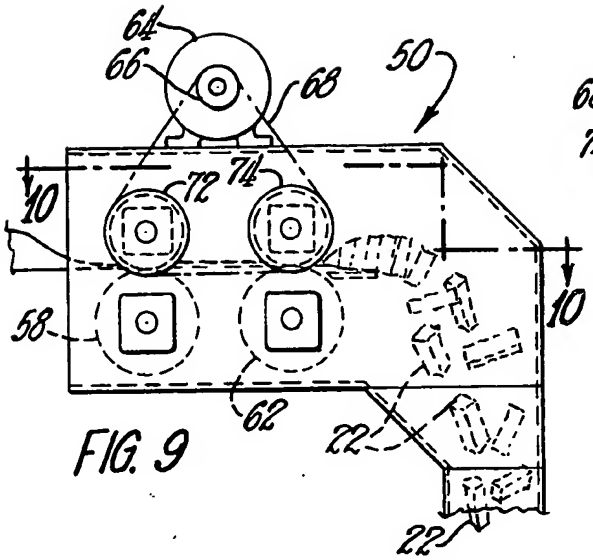

FIG. 9

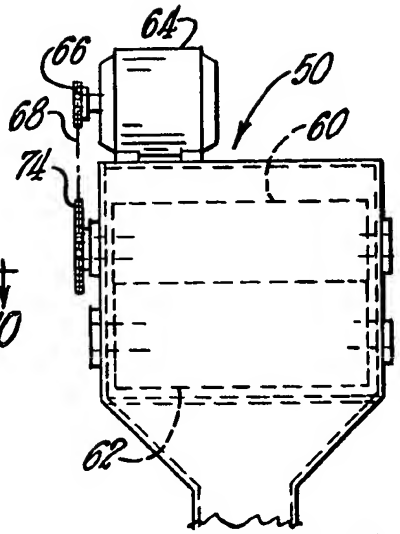

FIG. 11

SPECIFICATION

Fibrous glass blowing insulation

This invention relates generally to blowing wool insulation, and more particularly to fibrous glass flakes for blowing into enclosed spaces as insulation.

For a number of years the commercial process of making blowing wool insulation has included the use of a hammermill wherein rotating hammers in a casing break up masses of fibrous glass wool and force it through a plate having a plurality of orifices to form it into irregularly shaped nodules.

A non-commercial process of making blowing wool nodules is disclosed in U.S. Patent No. 2,219,285, issued on October 29th, 1940, to Frank E. Allen and Harry V. Smith. In this patent, masses of fibrous glass wool are picked apart and the fibers are reformed into an even mat which is sprayed with water and slit and chopped into cubes. The cubes are advanced through troughs in which they are paddled by a series of rotating beater blades and rolled into nodules.

This invention is aimed at producing fibrous glass insulation product of improved economy and insulation quality.

According to the invention there is provided blowing insulation comprising laminar fibrous glass flakes of various thicknesses. In the preferred case the flakes are formed from laminar fibrous glass columns which break up at random during handling.

The blown density of the insulation is preferably from 0.3 to 0.6 pounds per cubic foot (0.0048 to 0.0056 g/cc) or more preferably from 0.45 to 0.55 pounds per cubic foot (0.0072 to .0088 g/cc) and especially from 0.47 and 0.52 pounds per cubic foot (0.0075 to .0083 g/cc). Ideally the blown density is 0.5 pounds per cubic foot (0.008 g/cc).

Preferably the product of conductivity (K) and density (d) in the as blown condition of the insulation is less than 0.27, where K is measured in terms of British thermal units/(hour) (square foot) (degree fahrenheit/inch) and d is measured in pounds per cubic foot, or 0.000214 when K is measured in Cals/(sec) (sq.cm.)C°C/cm.) and d is measured in g/cc or more preferably substantially 0.25, where K is measured in British thermal units/(hour) (square foot) (degree fahrenheit/inch) and d is measured in pounds per cubic foot, or 0.0002 when K is measured in Cals/(Sec) (sq.cm.) C°C/cm.) and d is measured in g/cc.

Preferably the columns are square or diamond shaped, measure three and one-half to five inches (89 to 127 mm) in height originally, and measure about one half inch (13 mm) between each pair of opposite sides in plan view.

The invention includes a process of making blowing insulation comprising longitudinally slitting a fibrous glass blanket into strips at a slitting station, crosscutting the strips into columns at a crosscutting station, and bagging the columns, or flakes of various thicknesses into which the columns break at random upon handling.

Preferably there is provided a process of making blowing insulation comprising forming glass fibers from molten glass, spraying the fibers with a binder, collecting the sprayed fibers on a conveyor to form a fibrous glass blanket, conveying the blanket through an oven to cure the binder, longitudinally slitting the blanket into strips at a slitting station, angularly crosscutting the strips into diamond-shaped columns at a crosscutting station, and bagging the columns, or flakes of various thicknesses into which the columns break at random upon handling.

Preferably the process is carried out without performing any other intentional machine forming operation on the columns between the crosscutting station and the bagging station other than transporting the columns therebetween.

The invention also includes apparatus for making blowing insulation comprising a conveyor means associated with the conveyor for longitudinally slitting a fibrous glass blanket on the conveyor into strips, means associated with the conveyor for crosscutting the strips, to form columns, and means for bagging the columns or flakes of various thicknesses into which the columns break at random upon handling.

By means of the invention as smaller weight of flakes can be used than the weight of hammermilled nodules required for equivalent insulation value.

Embodiments of the invention are hereafter described with reference to the accompanying drawings, in which:–

Figure 1 is a perspective view of a column of blowing wool as it could be made in accordance with the invention;

Figure 2 is a perspective view representative of approximate cubes or smaller flakes into which the column of Fig. 1 breaks at random upon handling;

Figure 3 is a plan view of a column of blowing wool as it would be produced by the apparatus disclosed herein;

Figure 4 is a plan view of the column of Fig. 1;

Figure 5 is a plan view of an alternatively shaped column of triangular cross-section;

Figure 6 is a schematic side elevational view of apparatus used to produce the blowing wool insulation of the invention;

Figure 7 is a fragmentary end elevational view taken generally in the direction of arrows 7–7 of Fig. 6;

Figure 8 is a fragmentary enlarged perspec-

tive view of a slitting and crosscutting portion of the apparatus of Fig. 6;

Figure 9 is a fragmentary enlarged side elevational view of a slitting and crosscutting portion of the apparatus of Fig. 6;

Figure 10 is a fragmentary sectional view taken generally along the line 10–10 of Fig. 9;

Figure 11 is a fragmentary end elevational view of the apparatus of Fig. 9; and

Figure 12 is an enlarged cross-sectional view of one of the crosscutting rolls of the apparatus of Fig. 6.

With respect to the drawings, Fig. 1 shows a column 20 of fibrous glass blowing insulation as it could be produced by the slitting and crosscutting of a fibrous glass blanket in accordance with the invention. A plan view of the column 20 is shown in Fig. 4. Fig. 2 shows the column 20 broken apart into a representative approximate cube 20a and representative smaller flakes 20b, 20c, 20d, 20e, 20f, 20g, 20h, 20i and 20j. The column 20 breaks apart at random into flakes of various thicknesses upon handling, bagging, and blowing into an attic space as insulation. By way of example, the column 20 may be about three and one-half to five inches (89 to 127 mm) in height and measure about one-half inch (13mm) between each pair of opposite sides in the plan view, it being understood that other dimensions and shapes may be used without departing from the spirit and scope of the invention. Fig. 3 shows an alternative diamond-shaped column 22 which would be produced by the apparatus disclosed herein and Fig. 5 shows an alternatively shaped triangular column 24.

In Fig. 6 apparatus for making the columns 22 of blowing wool is shown. Streams 28 of molten glass are supplied from the forehearth 30a of a furnace 30b to conventional rotary fiberizers 32 to form veils 34 of glass fibers which are collected on a conveyor 36 to form a fibrous glass blanket 38. A binder is sprayed on the glass fibers in the veils 34 by means not shown. Normally spraying nozzles are mounted on the outer shields of the rotary fiberizers 32. The blanket 38 is conveyed by a conveyor 39 through a curing oven 40 wherein the binder is cured to bond the fibers to each other. A rotary saw 42 downstream of the curing oven 40 slits the blanket 38 into two segments 38a and 38b, as best shown in Fig. 8, and a wedge 44 moves the segments 38a and 38b apart before they are fed between a pair of compression rolls 46 and 47. The blanket segment 38a is then fed to an enclosed slitting and crosscutting mechanism 50 while the blanket segment 38b is fed to an identical slitting and crosscutting mechanism 51 (Fig. 7). In the mechanism 50 and 51, the blanket segments are longitudinally slit and crosscut into columns such as the column 22 and the columns, by way of example, may be delivered to a common hopper 52a forming part of a conventional bagging machine 52. The bagging machine 52 includes a pair of ducts 52b and 52c having a common junction 52d joined to the hopper 52a. Within the junction 52d is a pivotable diverting plate 52e which selectively blocks one of the ducts 52b and 52c while diverting the output of columns 22 from the hopper 52a to the other duct. Each of the ducts is connected to a bagging chamber such as the chamber 52f having a piston 52g therein for compressing columns 22 into a bag 54.

The mechanism 50 is best shown in Figs. 9 to 11, it being understood that mechanism 51 is identical. The mechanism 50 includes a slitting roll 56 with a back-up roll 58 and a rotary die or crosscutting roll 60 with a back-up roll 62, each roll having an appropriate shaft and bearings. A motor 64 having a sprocket wheel 66 drives the slitting roll 56 and the crosscutting roll 60 by means of a chain 68 and sprocket wheels 72 and 74 respectively operatively connected to the rolls.

The roll 56 includes a plurality of frustoconical slitting discs. The roll 60 resembles a double helical or herringbone gear with cutting edges as best shown in Fig. 12. Columns such as column 20 of Figs. 1 and 4 could be cut with cutting edges extending axially of the roll, but it is believed that the herringbone pattern, which cuts columns of diamond shape as shown in Fig. 3, will result in longer life for the cutting edges. In actual practice, a small amount of clearance is provided between the slitting roll 56 and its back-up roll 58 and also between the crosscutting roll 60 and its back-up roll 62. The blanket segments 38a and 38b are compressed during slitting and crosscutting, but the columns such as column 22 expand upon release back substantially to the original blanket thickness.

In a test conducted to demonstrate the improvement provided by the invention, standard hammermilled blowing wool was compared with the blowing wool of this invention. The hammermilled blowing wool had a blown density (d) of 0.67 pounds/cub.ft, or 0.011 g/cc and conductivity (K) of 0.461 BTU/(hr.) (Sq.ft.) (°F/in.) or 0.0228 Cal/(sec.) (sq.cm) (°C/cm.) at that density, while the glass wool flakes or prisms had a blown density (in the same units) of 0.475 (0.0076) and a conductivity of 0.529 (0.0262).

The amount of insulation required per unit of thermal resistance is directly proportional to the thermal conductivity and density. Using the above figures, for the same insulation value, only 81 percent as much weight of the flakes or prisms would have to be used as hammermilled blowing wool [(.529 × .475)/(.461 × .67) = .81]. This represents a saving of 19% in the weight of glass wool required for the same insulation value.

The base wool, for example the wool in the blanket 38, from which the hammermilled blowing wool and the flaked blowing wool for the above test were produced, had a density of 0.615 pounds per cubic foot (0.0106 g/cc), a binder content of 4.5 percent, and a fiber diameter of 0.00028 inches (0.00711 mm.).

CLAIMS

1. Blowing insulation comprising laminar fibrous glass flakes of various thicknesses.

2. Blowing insulation as claimed in claim 1 wherein the flakes are formed from laminar fibrous glass columns which break up at random during handling.

3. Blowing insulation as claimed in claim 1 wherein the blown density is from 0.3 to 0.6 pounds per cubic foot (0.0048 to 0.0056 g/cc).

4. Blowing insulation as claimed in claim 1 wherein the blown density is from 0.45 to 0.55 pounds per cubic foot (0.0072 to .0088 g/cc).

5. Blowing insulation as claimed in claim 1 wherein the blown density is between 0.47 and 0.52 pounds per cubic foot (0.0075 to .0083 g/cc).

6. Blowing insulation as claimed in claim 1 wherein the blown density is substantially 0.5 pounds per cubic foot (0.008 g/cc).

7. Blowing insulation as claimed in claim 1 wherein the product of conductivity (K) and density (d) in the as blown condition of the insulation is less than 0.27, where K is measured in terms of British thermal units/(hour) (square foot) (degree Fahrenheit/inch) and d is measured in pounds per cubic foot, or 0.000214 when K is measured in Cals/(sec.(sq.cm.)C°C/cm.) and d is measured in g/cc.

8. Blowing insulation as claimed in claim 1 wherein the product of conductivity (K) and density (d) in the as blown condition of the insulation is substantially 0.25, where K is measured in British thermal units/(hour) (square foot) (degree Fahrenheit/inch) and d is measured in pounds per cubic foot, or 0.0002 when K is measured in Cals/(Sec.) (sq.cm.)C°C/cm.) and d is measured in g/cc.

9. Blowing insulation as claimed in any preceding claim wherein the flakes are diamond-shaped in plan view.

10. Blowing insulation as claimed in any of claims 1 to 8 wherein the flakes are substantially square in plan view.

11. Blowing insulation as claimed in any of claims 1 to 8 wherein the flakes are triangular in plan view.

12. Blowing insulation as claimed in any preceding claim wherein the flakes are formed from laminar fibrous glass columns which break up at random during handling and wherein the columns are square or diamond shaped, measure three and one-half to five inches (89 to 127 mm) in height originally, and measure about one-half inch (13mm) between each pair of opposite sides in plan view.

13. Blowing insulation according to claim 1 and substantially as described and illustrated herein.

14. A process of making blowing insulation comprising longitudinally slitting a fibrous glass blanket into strips at a slitting station, crosscutting the strips into columns at a crosscutting station, and bagging the columns, or flakes of various thicknesses into which the columns break at random upon handling.

15. A continuous process of making blowing insulation comprising forming glass fibers from molten glass, spraying the fibers with a binder, collecting the sprayed fibers on a conveyor to form a fibrous glass blanket, conveying the blanket through an oven to cure the binder, longitudinally slitting the blanket into strips at a slitting station, angularly crosscutting the strips into diamond-shaped columns at a crosscutting station, and bagging the columns, or flakes of various thicknesses into which the columns break at random upon handling.

16. A process as claimed in claim 14 which is carried out without performing any other intentional machine forming operation on the columns between the crosscutting station and the bagging station other than transporting the columns therebetween.

17. A process as claimed in claim 15 substantially as described and illustrated herein.

18. Apparatus for making blowing insulation comprising a conveyor, means associated with the conveyor for longitudinally slitting a fibrous glass blanket on the conveyor into strips, means associated with the conveyor for crosscutting the strips to form columns, and means for bagging the columns or flakes of various thicknesses into which the columns break at random upon handling.

19. Apparatus as claimed in claim 18 substantially as described and illustrated herein.

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